SATURDAY, FEBRUARY 14, 1925.

CONTENTS.

	PAGE
Preservatives in Foods	217
Philosophical Biology. By J. B. S. H.	218
The Study of Agricultural Economics. By J. A. Venn	220
The Chemistry of Flour Milling. By G. W. M.-W.	222
New Measurements of Atomic Masses. By E. N. da C. A.	222
Our Bookshelf	223
Letters to the Editor:	
The Future of the Meteorological Office.—**Dr. G. C. Simpson, F.R.S.**	226
High Energy γ-Ray from Thorium Disintegration Products.—**D. H. Black**	226
Touch and Sight *v.* the Microscope in Wool Classing and Sorting.—**Prof. A. F. Barker**	226
The Theory of Hearing.—**Prof. E. W. Scripture**	228
The Ages and Masses of the Stars.—**Prof. F. A. Lindemann, F.R.S.**	229
On the Hardness of Manganese Steel.—**Prof. Carl Benedicks**	230
A Stroboscopic Method of Determining Surface Tension of Liquids.—**Prof. P. N. Ghosh** and **D. Banerji**	230
The Permanence of Substance. By **Sir Joseph Larmor, F.R.S.**	231
Biographical Byways. By **Sir Arthur Schuster, F.R.S.**—**J. Osborne Reynolds**	232
The Fossil Anthropoid Ape from Taungs. By **Sir Arthur Keith, F.R.S., Prof. G. Elliot Smith, F.R.S., Sir Arthur Smith Woodward, F.R.S.,** and **Dr. W. L. H. Duckworth**	234
Obituary:—	
Mr. Oliver Heaviside, F.R.S. By **Dr. A. Russell, F.R.S.**	237
Prof. N Kulchitsky. By G. V. A.	238
Dr. David B. Spooner. By S. M. E.	238
Current Topics and Events	239
Our Astronomical Column	243
Research Items	244
The Water Supply of Egypt and the Sudan. By H. G. L.	247
Occurrence and Use of Bitumen	247
University and Educational Intelligence	248
Early Science at Oxford	248
Societies and Academies	249
Official Publications Received	251
Diary of Societies	251

Editorial and Publishing Offices:
MACMILLAN & CO., LTD.,
ST. MARTIN'S STREET, LONDON, W.C.2.

Editorial communications should be addressed to the Editor.
Advertisements and business letters to the Publishers.

Telephone Number: GERRARD 8830.
Telegraphic Address: PHUSIS, WESTRAND, LONDON.

NO. 2885, VOL. 115]

Preservatives in Foods.

THE difficulty of drawing inferences of value in practical life from experimental work on animals or from observation on man could not be better illustrated than in the vexed question as to the legitimacy of allowing preservatives, especially boron preparations, in human foods. It is known that these preparations, when given steadily and persistently to animals, provoke renal inflammation; it is commonly agreed, notwithstanding occasional medical testimony to the contrary, that they may be irritant to the human alimentary tract, and that they should be barred for young children, for invalids, and for sick persons. It is also agreed that the elimination of a single dose of boric acid is slow, occupying five or six days, and that, therefore, most of us who live in towns are probably never free from boric acid in our systems from youth to old age. It is, furthermore, common knowledge that boric acid or its salts are used largely in cream, butter, liquid eggs, margarine, potted meats, and are dusted over imported bacon and ham; and that a person indulging in a varied diet may not impossibly, day by day, take an amount of boric acid which, even by the defendants of boron preservatives in food, would be regarded as inadvisable, if not actually injurious.

These and like considerations were before the Departmental Committee of 1900 and the more recent committee, the interim and final reports of which were summarised in the issues of NATURE for September 20 and December 13, 1924.

The Committees also had before them the important consideration that the use of boron preparations is not unlikely to foster the continuance of less cleanly processes of food preparation and to conceal incipient and possibly dangerous stages of decomposition of food. In this connexion, it is noteworthy that the prohibition of any preservative in milk has proved most successful, and has doubtless led to increased cleanliness in its production, transport, and storage. It has also been associated with increased use of pasteurisation, which may in some measure permit the continuance of relatively unsatisfactory production of milk; but, even so, pasteurised milk or cream represents a hygienic advance upon boricised milk or cream. It is not surprising, therefore, that the recent Committee recommends that the use of boron preparations as food preservatives should be prohibited; and the Minister of Health has indicated his intention to make draft regulations for this purpose. (For the sake of brevity, boron preservations alone are considered in this article.)

Already there are indications that the proposed regulations will not be universally approved. Sir William Pope, professor of chemistry in the University

of Cambridge, has advanced in the *Times* weighty points for consideration. He regards the evidence of injury by boron preservatives as not convincing, and stresses the complexity of factors involved in human experimentation with such preparations, owing to the diverse factors concerned in the balance of health and disorder. Similarly, Dr. R. Hutchinson writes stating that if injury from such preparations occurs, "it has entirely escaped the notice of medical men." Also, Prof. F. W. Tunnicliffe considers that in deciding against the use of boric preservatives "*a priori* argument has been drained to its dregs," and inadequate attention has been paid—as Sir William Pope had already suggested—to the danger of dearer and scarcer food, as the result of the prohibition of preservatives for perishable foods needing to be transported long distances. At the least it appears to be suggested, let us postpone the prohibition of boric preservatives until the mass processes of production and transportation of perishable food have become perfected. Great waste of food is avoided by mass production. Mass production is indispensable under modern conditions of life; and the means of transport within Great Britain do not permit, it is urged, even if those from other countries permit, of cold storage and transportation, to an extent which will avoid much waste of valuable food, if preservatives are forbidden.

As indicating the way in which politics may influence hygienic control, it is suggested that the prohibition of boric preservatives in Germany is, in part at least, enforced in order to keep out Canadian and American bacon and ham. The same effect might follow from a similar prohibition in Great Britain; and so we have illustrated the struggle and conflict of motives and aims which almost necessarily arise when any reform which is theoretically desirable is proposed. Motives of preferential trading may arise, the plea is entered that the proposed action will involve the wasting of much perishable food, and it is contended—as may easily be done—that the evidence of injury from the preservatives proposed to be prohibited is dubious and may even be non-existent.

These are reasons for proceeding cautiously, and there need be no extravagant fear that the Ministry of Health will proceed otherwise. But that the use of chemical preservatives is undesirable is, we think, indisputable; that their restriction and their extended restriction should be enforced, follows as a desirable reform; and in our view this restriction is not likely to be followed by increased scarcity of food, for we have every confidence in the ability of those concerned to improve their methods of manufacture and of transport, so as to obviate the need of any preservative except cold.

In deciding a complex practical problem like this, we are bound to consider the weaker members of the community, for whom doses of boric preservatives not producing recognisable symptoms in the majority, are likely to be serious, and this consideration alone suffices, we think, to justify extension of the present regulations against food preservatives in the direction recommended by the recent Departmental Committee. It has been urged that in this connexion Solon's advice to the Athenians should be followed: Have the best laws that can be kept, not the best laws that can be made. But past experience has shown that gradually increasing stringency in regulating food preservatives can be enforced, and that it is associated with better processes of preparation and transportation of food; and the next steps in this direction may be expected to have similar results.

Philosophical Biology.

(1) *The Study of Living Things: Prolegomena to a Functional Biology*. By Dr. E. S. Russell. Pp. xx+139. (London: Methuen and Co., Ltd., 1924.) 5*s*. net.

(2) *The Passing of the Phantoms: a Study of Evolutionary Psychology and Morals*. By Prof. C. J. Patten. Pp. 95+4 plates. (London: Kegan Paul and Co., Ltd.; New York: E. P. Dutton and Co., 1924.) 2*s*. 6*d*. net.

(3) *Tantalus: or the Future of Man*. By Dr. F. C. S. Schiller. Pp. 72. (London: Kegan Paul and Co., Ltd., 1924.) 2*s*. 6*d*. net.

As the reading public gradually accepts the doctrine of evolution and its corollary, the unity of life, a demand arises for books which deal, on one hand, with the application of biological methods and ideas to human life, and on the other, with an analysis of those ideas. With the narrowing of the gulf between man and the other animals, we find a quite legitimate tendency to interpret the mind of animals in terms of the human mind, and conversely. But such a procedure demands enormous caution, and one can scarcely hope to find the necessary critical attitude in books which are written to defend a point of view rather than to examine all sides of a problem. Yet they may justify themselves if they are sufficiently stimulating or attractive.

(1) Dr. Russell's book deals with the various methods by which biological problems may be attacked. After a passing reference to the purely morphological point of view, he briefly examines and rejects the materialistic conception of life, and points out its failure to explain the unity of the organism. Vitalism, that is, the theory that an organism consists of inert matter plus a soul or entelechy, is shown to have its own difficulties without solving those of materialism. So far Dr. Russell is in agreement with J. S. Haldane, whom

he quotes at length. But he regards Haldane's position as essentially a half-way house, also tenanted by J. B. Watson, to his own psychological outlook. "I know myself," he says, "as a psycho-physical unit or individuality, not as an immaterial entity acting upon an external material object, my body." It is from this point of view that he considers the behaviour of other organisms as exemplified not only by movement and secretion, but also by such activities as growth. The latter half of his book is taken up with the attempt to apply this view in detail. For example, it is suggested that the growth-regulating secretion of the thyroid gland "acts not directly by virtue of its specific chemical constitution, but indirectly by virtue of its meaning or significance, being perceived or sensed in an elementary way by the organs and responded to in the functional or psychobiological sense."

Apart from his complete neglect of such difficulties for a monadistic view as are presented by fission or conjugation, for example, we are inclined to regret that Dr. Russell does not push this point of view to its logical conclusion. From a strictly psychological point of view he has no business to talk about internal secretions, and adrenaline, for example, is not an aromatic amine from his point of view, but simply an element in certain emotional states. As it is, we feel that he tends to use physics and chemistry so long as they suit him, and adopts a psychological point of view when the complexity of the physico-chemical situation becomes intolerable. But few biologists achieve consistency in their hypotheses, and we can recommend Dr. Russell's book to all who are interested in the philosophical side of biology.

So far man has only learned to think on two lines, one which enables us to deal with our fellow-men and the higher animals, the other with inanimate objects; but it does not follow that these are the only possible types of thought. Perhaps some intermediate outlook, which preserves the unity attributed to the human individual though without his memory or foresight, may prove valuable in dealing with lowlier organisms or with our own unconscious behaviour.

(2) Prof. Patten's book, after a thumb-nail sketch of evolution, plunges into animal psychology; and human attributes, such as admiration, imagination, and superstition, are assigned to birds and mammals. The bearing of animal on human psychology is discussed, with special reference to the origin of human superstitions, which include all beliefs in supernatural beings. The book makes no attempt to be either scientific or exhaustive, but it is so charmingly written that we believe it will find many readers. It is clear that the author is a real lover of animals, and if his love leads him into a perhaps unduly confident belief that they are on the whole virtuous and happy, it inspires a number of delightful anecdotes of animal behaviour. His religion, a sunny rather than philosophical pantheism, springs directly from his love of Nature. There is little that is novel in the book, but the author's point of view is worth restating from time to time. As a means of bringing home the reality of evolution to the average child of sixteen or so, we feel that it might be of real value in school libraries.

(3) "Tantalus," who here represents humanity as a whole, is a philosopher's reaction to biology. The reaction is sometimes rather naïve, as when he pauses to wonder that from the biological point of view man has not evolved in the last thirty thousand years. Critics of their fellow-creatures, and particularly of the present Government, would do well to remember Lingula, which has scarcely changed in the three million or so centuries that have elapsed since Ordovician times. Dr. Schiller very rightly stresses the fact that in our society those social classes which we admire most are reproducing themselves most slowly, but some of the reasons given for this fact are, to say the least, unconvincing. For example, the author alleges that the advance of medicine has enormously diminished selective mortality and improved the chances of weaklings to survive and leave descendants. The contrary case could be argued, for in the last two centuries epidemic diseases such as smallpox have almost disappeared, and more chronic complaints such as tuberculosis, which kill far less indiscriminately, have remained with us. The question whether the differential birth-rate may not be due to certain economic features of our civilisation rather than to its philanthropy and hygiene is scarcely considered.

With regard to the traditions which constitute man's non-biological inheritance, Dr. Schiller is equally gloomy. Perhaps it is a too intimate acquaintance with compulsory chapel and university examinations which prompts him to ask, "How many religions have perished from ritual sclerosis, how many sciences have not been degraded into pseudo-sciences or games?" He suggests two ways out of the impasse, one being the practice of Christian ethics, the other of eugenics. He believes that history has shown that humanity as at present biologically constituted will not accept the former. He has more hope of the latter, provided we realise that our whole procedure is essentially experimental. He has also some confidence in the future of applied psychology. The scientific reader who is interested in the reaction of biological ideas on the mind of an intelligent outsider, or wishes to see the case for eugenics briefly stated without the display of too much class or racial prejudice, would do well to buy this little essay. J. B. S. H.